Control of Hazardous Mechanical Energy
And
Electrical Work Practices

Purpose
To establish the minimum requirements for the lockout or tagout of hazardous energy isolation devices to prevent the unexpected energization or startup of equipment or release of stored energy. Lockout/Tagout (LOTO) is an effort to protect the employee from injury when he or she is performing maintenance on equipment. LOTO is an OSHA mandated safety requirement for all manufacturing environments.

Scope and Application
Two standards, which require LOTO, are 1910.147 (Control of Hazardous Energy) and 1910.333 (Electrical Safe Work Practice Standard). This program establishes the written requirements of these two regulations.

Lockout is the preferred method of isolating machines or equipment from non-electrical energy sources and shall be used whenever possible. All equipment obtained or modified after January 2, 1990, will be installed with lockout capability. If tags are used, additional steps shall be taken as may be necessary to provide the equivalent safety available from the use of a lockout device.

When performing electrical work, **both** locks and tags shall be used.

LOTO applies anytime an employee is required to put any portion of his or her body in an area of the machine or equipment where moving parts or energy can cause injury. This also applies to workers putting tools such as scrapers, shovel, pitchforks, etc., into the moving parts of equipment. The LOTO requirements **do not** apply to the following.

1. Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, if they are routine, repetitive and integral to the use of the equipment for production, **provided** that the work is performed using alternative measures which provide effective protection and comply with Subpart O, the machine guarding standards. In other words, **the worker will be protected at all times**.
2. Work on cord or plug connected devices for which exposure to hazards can be effectively controlled by unplugging or disconnecting the device from its sole power source and keeping the plug under the **EXCLUSIVE** control of the person performing the maintenance.
3. Work on vehicles for which exposure to hazards can be effectively controlled by the mechanic having the keys in his or her possession during the maintenance work **and** removing a battery terminal.

Employee Classification
1. *All employees*: Every employee at the manufacturing site, regardless of his or her work assignment or position, shall be instructed about the procedures and requirements of the LOTO program.
2. *Affected employees*: Every employee whose work assignments require that he or she operate equipment or work in an area where LOTO devices are used. Affected employees are not charged to apply LOTO devices but are charged with understanding the procedures in order to effectively monitor the process and take corrective actions when they are violated.
3. *Authorized employees*: Every employee who has been given the authority, responsibility, and training to implement the LOTO procedure on specified pieces of equipment. Authorized employees are required to thoroughly understand the LOTO procedures and be certified on each piece of equipment by the supervisor or manager. Every authorized employee will be issued a lock and tag specifically identified to be used for LOTO.

General Requirements
1. Every energy-isolating device capable of being locked out must have a lock and tag properly applied according to the procedures. If more than one energy source or stored energy, consult Appendices A of this program for details. If no specific procedure, than no work can be performed until a procedure is written and provided to the authorized person.
2. Energy isolating devices **NOT** capable of being locked out must be tagged out according to the procedures. Every precaution shall be taken for tagging out a piece of equipment in order to reduce the chance of

inadvertent re-energization of the equipment. The tag must be applied in such a manner that it will withstand any environmental conditions for whatever period of time necessary and retain the required information. Additional precautions such as pulling fuses, locking a breaker box or door to a panel room, or applying additional tags around the work site should be taken. **NOTE:** After January 1990, all equipment installed or modified will be installed with lockout capability.

3. Locks and tags must be singularly identified and issued to authorized employees. They shall not be used for any other purpose and must be standardized in color, shape and size. Locks and tags must be capable of withstanding the environment to which they will be exposed for the maximum time they are to be applied. Application of a lock and tag must be substantial enough to prevent their removal without the use of excessive force or unusual techniques.
4. The authorized employee to who it was issued shall apply a LOTO device. Locks and tags **CANNOT** be loaned to another authorized employee. Each authorized employee performing maintenance on a piece of equipment must apply their own lock and tag prior to placing their body in a danger area. Affected employees **MUST NOT** perform or help perform any maintenance on equipment even if it has been locked out by an authorized employee.
5. Outside personnel or contractors are required to follow the company's LOTO procedures even though their LOTO devices may be different in size, shape and color from ours. It is the department manager's responsibility to ensure that the outside personnel or contractor understands and adheres to our procedures.
6. **Failure to comply with the LOTO procedures will result in disciplinary action and may result in employee discharge.**

Procedure for Applying LOTO

Only an **authorized employee** certified to lockout and tagout a specific piece of equipment shall be allowed to perform the LOTO procedure.

1. *Notification of employees:* The authorized employee must notify all affected employees in the area that a LOTO of a piece of equipment is going to take place.
2. *Preparation for shutdown:* The authorized employee shall locate and identify **all** energy sources for that piece of equipment and the means to release any stored energy.
3. *Equipment shutdown:* If the piece of equipment is being operated it should be shut down according to normal stopping procecedures.
4. *Equipment isolation:* Energy isolating devices for that piece of equipment shall be switched to the OFF position to isolate it from **all** sources of energy.
5. *LOTO application:* The specified lock shall be applied to the energy isolating device in such a manner as to safety hold the device in the OFF position. The specified tag, if used, shall be clearly filled out with the authorized employee's name, the date, the equipment name or number or both, and a brief description of the maintenance being performed. The tag or tags must be affixed in such a manner that they are readily visible at the isolation device and will withstand the environmental conditions for the necessary length of time. Additional tags may be placed at the work site or any other area deemed necessary. **NOTE:** When performing electrical work, you must comply with the requirements of 1910.333 and you will use both locks and tags.
6. *Release stored energy:* All potentially hazardous stored energy must be released by pushing the normal start buttons to verify the isolation of energy. Opening of valves might also be necessary with pneumatic, hydraulic, vacuum or pressurized water systems to release stored energy. When the isolation is verified and the stored energy is released, the normal STOP buttons should be activated.
7. *Verification of isolation:* Before starting maintenance on the equipment, the authorized employee must take a moment to verify that the equipment has been properly isolated-LOTO- and that all affected employees are clear of the danger area.

Release From LOTO

1. *Inspection of area:* The work area must be inspected by the authorized employee to ensure that all tools and nonessential items are put away. All guards and equipment components must be operationally intact on the equipment.
2. *Notification of employees:* The authorized employee must notify the affected employees in the area where the equipment is about to be reenergized. He or she must make a visual check of the area to ensure no one is in the danger area.

3. *Removal of LOTO devices:* The authorized employee must remove his or her lock and tag. The energy-isolating device should then be switched back to the ON or energized position.

LOTO Removal by Someone Other Than the Authorized Employee
If for some reason the authorized employee who applied the LOTO device is not available to remove it, the device can only be removed according to the following procedure:

1. Verify that the authorized employee who applied the lock is not on site and cannot be reached. Every effort must be made to contact the employee to have him or her return to remove the LOTO device.
2. Contact the manager of the affected area and inform him or her of the situation. The manager will verify that the employee cannot be contacted and will fill out the required form: LOCKOUT REMOVAL NOTICE. The manager will verify that it is safe to have the device removed. The manager can then remove the device. (**NOTE:** you will need to develop the Lockout Removal Notice).
3. The manager must ensure that the authorized employee is notified about the device removal before they begin work the following day.

Shift or Personnel Changes
While maintenance work is in progress and shift or personnel changes occur, the continuity of LOTO protection must be maintained. The incoming employee must notify the working employee of his or her intention to assume the maintenance on that piece of equipment. The working employee must give the incoming employee a complete update of the status of that piece of equipment. The incoming employee must apply his or her LOTO devices according to the procedure. When he or she has completed that function, the working employee can remove his/her lock and tag according to the procedure.

Procedure Involving More Than One Person
If more than one individual is required to perform LOTO, each authorized employee shall place his or her own assigned LOTO device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks or tags, a multiple LOTO device (hasp) may be used. If lockout is used, a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet, which allows the use of multiple locks to secure it. Each employee will then use his or her own assigned lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove their lock from the box or cabinet.

Troubleshooting
Certain conditions require that maintenance be performed while the equipment is in an energized state. Troubleshooting equipment in an energized state is **very hazardous** and must be performed only by an **Authorized Troubleshooter**. A list of Authorized Troubleshooters will be posted in each area. The equipment and area must be adequately secured during troubleshooting in such a fashion so as to maintain operations and still protect the troubleshooter while he or she is working. The authorized troubleshooter must lockout and tagout equipment to perform functions that do not require that the piece of equipment be in an energized state for repair.

Periodic Evaluations
Periodically (at least annually) the effectiveness of the entire program will be evaluated by an authorized employee(s) other than the ones utilizing the energy control procedures being inspected. Any deviations or inadequacies shall be documented and corrected. The date of the inspection will be documented on the Annual Inspection Report and maintained as a part of this program until the next evaluation replaces it.

Training
Training shall be given to all authorized, affected and other personnel as required by 1910.147(c) (7) and 1910.332.

The plant manager will conduct training and prepare a record and certify that the employee training has been accomplished. The plant manager will conduct retraining when there is:

1. A change in job assignments.
2. A change in machines, equipment or processes that present a new hazard.
3. Additional retraining shall also be conducted whenever there is reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

Accidents Concerning LOTO

The plant manager will be responsible for fully investigating all LOTO accidents and reporting the cause of such accident. If the accident involved the control of hazardous energy with a single lockout source, a specific procedure will be written before work is continued. If the accident involved a specific procedure for a piece of equipment, the LOTO procedure will be evaluated and modified, if necessary, prior to authorizing work to continue.

Key Points of LOTO Program

- ✓ Procedures developed, documented and utilized for control of hazardous energy.
- ✓ Employer has provided locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners or other hardware for isolating, securing or blocking machines or equipment.
- ✓ LOTO devices singularly identified.
- ✓ LOTO devices used only for controlling energy and not other purposes.
- ✓ Durable LOTO devices must be capable of with standing the environment to which they are exposed for the maximum period of time that exposure is expected.
- ✓ LOTO devices must be standardized within each facility in at least color, shape or size.
- ✓ Use standardized print and format for tags and must be legible and understandable (may need bi-lingual).
- ✓ LOTO devices must indicate the identity of the employee applying the devices.
- ✓ After January2, 1990, new equipment or modifications must be designed to accept a lockout device.
- ✓ Inspect the LOTO program at least annually.
- ✓ Inspection performed by authorized employee other than those utilizing the energy control procedure under inspection.
- ✓ Correct any deviations or inadequacies observed found during the inspection
- ✓ Include review of each authorized employee's responsibilities under the procedures. If tagout is used, include review of limitations of tags.
- ✓ Tags must be substantial enough to prevent inadvertent or accidental removal.
- ✓ The attachment means for the tags must be non-reusable; attached by hand; self-locking; non-releasable with minimum unlocking strength no less than 50 pounds; at least equivalent in design and characteristics to one-piece; all environment tolerant nylon cable tie; if used with electrical must be non-conductive;
- ✓ Tags must warn against hazardous conditions if machine or equipment will be or is energized.
- ✓ Examples of wording on tags include "DO NOT START"; "DO NOT CLOSE"; "DO NOT ENERGIZE".
- ✓ Train on the limits of tags. For instance, tags are warning devices, not physical restraints; do not remove tags without authorization; do not bypass, ignore or otherwise defeat tags; tags must be legible and understandable; tags and means of attachment must be made of materials that will withstand workplace environmental conditions; tags may evoke a false sense of security; and tags must be securely attached to energy isolating devices.
- ✓ Tags must clearly indicate that the operation or movement of energy isolating devices from "SAFE" or "OFF" position is prohibited.
- ✓ Attach a tag at the same point that a lock would be attached if lockout capability existed. If the tag cannot affix to the energy isolating device, then affix as close as safety possible and in an obvious position.

Evaluation Documentation

Date(s) of evaluation_____. Evaluator_____.
General policy has been reviewed: Yes/No Review of OSH 200 Log for accidents related to LOTO: Yes/No

Any accidents related to LOTO: Yes/No. If Yes list below and list the specific LOTO procedure which requires review and possible modification.

Comments on general policy:

List the specific procedures evaluated:

List specific procedures which have been modified or added:

Appendix A
Energy Source Determination

In order to determine all energy sources for each piece of equipment, all questions must be answered. If the question does not apply, write N/A in the blank.

Date_____ **Conducted by_____**

Location:_____ Work Center_____
Line:_____ Equipment #_____
Equipment Name_____ Model_____
Procedure # Assigned_____ Serial #_____

List of authorized employees

Energy Determination	**Yes/No**	**Comments**
Electric power ?		If YES, list Motor Control Center (MCC) or power panel and breaker number:
Lockout device for electric power?		
Battery power?		If YES, list location
Engine driven?		If YES, switch or key location
Lockout device for engine?		If NO, list method of preventing operation
Spring loaded?		
Is there a method of preventing spring activation?		If NO, how can spring tension be safely released or secured?
Counter weight(s)?		
Can counter weights be prevented from moving?		
Can counter weights be locked out?		If NO, how can it be secured?
Flywheel?		
Does flywheel have a method of preventing movement?		
Can flywheel be locked?		If NO, how can it be secured?
Hydraulic power?		If YES, location of main control/shutoff
Can control or shutoff for hydraulic be locked in OFF position?		If NO, location of closest manual shutoff valve
Does manual shutoff valve have lockout device?		If NO, what is needed to lock valve closed?
Is there a bleed or drain valve to reduce pressure to zero?		If NO, what will be required to bleed off pressure?
Pneumatic energy?		If YES, location of main control/shut off valve
Can control/shutoff valve be locked in "OFF" position?		If NO, location of closest manual shutoff valve
Does manual shutoff valve have lockout device?		If NO, what is needed to lock valve closed?
Is there a bleed or drain valve to reduce pressure to zero?		If NO, what will be required to bleed off pressure?
Chemical system?		If YES, location of main control/shutoff valve.
Can control/shutoff valve be locked ?		If NO, location of manual shutoff

Does manual shutoff valve have lockout device?		If NO, what is needed to lock valve closed?
Is there a bleed or drain valve to safely reduce system pressure and drain system of chemicals?		If NO, how can system be drained and neutralized? What PPE will be needed for this procedure?
Thermal energy?		If YES, location of closest manual shutoff valve
Can control/shutoff valve be locked in OFF or closed position?		If NO, location of closest manual shutoff valve.
Does manual shutoff valve have lockout device?		If NO, what is needed to lock valve closed?
Is there a bleed or drain valve to safely reduce system pressure and temperature and drain system?		If NO, how can system pressure and temperature be reduced and drained? What PPE or equipment is needed ?
Are there any special precautions not mentioned in this table?		If YES, list them (i.e. fire hazards, chemical reactions, required cool down periods, etc.)

You can use the information on this document to develop a specific procedure which will protect the authorized employees who will be performing LOTO at your facility. Appendix C has a sample procedure form.

Appendix B
Electrical Work Practices

The adoption of the following elements for electrical work is designed for in-plant electrical work. This adoption of the following requirements is not intended to be used for high voltage work over 600 volts or exposure to overhead power lines.

Electrical LOTO (29 CFR 1910.333(b)(2)(iii)(A-E)

Electrical work requires a lock and a tag to be used together. However, a tag can be used by itself only if the electrical disconnecting source does not have lockout capabilities.

Locks can be placed without a tag only under the following conditions:

1. Only one circuit or piece of equipment is deenergized.
2. The lockout period does not extend beyond the work shift.
3. Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with the procedure.

A tag used without a lock shall be supplemented by one additional safety measure such as but not limited to removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

Electrical Test Verification of Deenergized Circuits (29 CFR 1910.333(b)(2)(iv)(B))

A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a results of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

Work on Energized Circuits

Approval must be obtained from (name or title of authorized management official) prior to work on energized circuits. (Name of management official) will be responsible for specifying appropriate personnel equipment to be used, to ensure compliance with 29 CFR 1910.335. Personal protective equipment for electrical hazards shall meet, be used and maintained in accordance with ANSI J6.1 through J6.7. Qualified employees for electrical work shall be aware of and follow the approach distances for qualified employees for alternating current as specified in Table S-5 of 29 CFR 1910.333.

Appendix C
Sample Written Procedure

Equipment, Machinery, or Process:_____
Specific Procedure No.:_____
Date Approved/Implemented:_____
Energy Control Measures Used in This Procedure:

Lock	Tag	Block	Blind	Other (be specific)
Yes/No	Yes/No	Yes/No	Yes/No	

Specific Procedure

Note: Required for all equipment, machinery, and/or processes that fail to meet the exceptions noted in 29 CFR 1910.147(c)(4)(i).

1. The purpose of this procedure is to protect the employees of _____.

Note: Failure to comply with these procedures will result in disciplinary action and may result in employee discharge.

2. Type(s) and Magnitudes(s) of energy and Hazards:

3. Names(s)/Job Title(s) of Authorized Employees:

4. Name(s)/Job Title(s) of Affected Employees and How to Notify:

5. Name(s)/Job Title(s) of Other Employees (if applicable):

6. Type(s) and Location of Energy Isolating Means:

7. Type(s) of Stored Energy-Methods to Dissipate or Restrain:

8. Additional Methods(s) Selected to Ensure that Tags Provide Adequate Level of Safety (i.e., removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, the removal of a valve handle to reduce the likelihood of inadvertent energization, blocks to support elevated members, blinds in pipes, etc.):

9. Type(s) of Equipment Checked to Ensure Disconnections:

10. Name(s)/Job Title(s) of Employees Authorized for Group Lockout/Tagout:

11. Special Precautions not Noted Above (i.e. fire hazards, chemical reactions, required cool down periods, etc.)